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Vision examinations of severely handicapped children

Abstract

Vision examinations of severely handicapped children

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Steve Dipple

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THESES

NELSON J

VISION EXAMINATIONS
OF
SEVERELY HANDICAPPED CHILDREN

Jorgen Nelson

Feb. 12, 1979

Advisor: Dr. Steve Dipple
Dr. Robert Yolton

Approved by



Feb. 12, 1979

Children with mental retardation, and an associated language defect, have a high incidence of visual defects as shown by Lawson.⁶ He examined 103 mentally retarded children age 3 to 22 and found only 28% were visually normal, compared with 75% being visually normal in a population of children who weren't mentally retarded but of a similar age group. Deviations from normal included 44 children with one diopter or more of myopia, hyperopia or astigmatia, 10 had nystagmus, 22 had strabismus and 9 had amblyopia. Smith found similar defects in 188 mentally retarded children with 97 having strabismus, 20 with nystagmus and 16 showed restriction of ocular motility.¹² He concluded these children had many more defects in vision than a population of normal children of the same age group. Manely and Schultz indicated mentally retarded children have a higher than normal incidence of hyperopia than normal children of the same age.⁸ These researchers indicate the mentally retarded child to be of high risk of having visual disorders.

Optometrists take care of vision problems for a great many people, yet for the child who has learning problems our 21 point visual examination would be difficult or impossible to perform. This project seeks to develop an examination sequence that can be used on the language impaired or mentally impaired child. Some children for whom this exam will be useful are autistic, mentally retarded and infantile schizophrenia children. Areas of performance an optometrist would like to evaluate are visual acuity, refractive error, eye posture, eye movement characteristics, (nystagmus, pursuits, rotations, saccades), eye-hand coordination, balance, laterality and directionality, motility in light and darkly illuminated rooms, paper and pencil skills, near point of convergence, pupillary skills, and internal and external ocular health determination.

Acuity can be measured using a technique described by Lawson.⁶ The procedure requires that a child be able to recognize pictures of various items familiar to him. Lawson used pictures from the Peabody Test. Pictures were calibrated for a 6 meter test distance to match sizes of standard test letter (ie 20/100, 20/70, 20/30). Lawson suggests each picture be presented individually and the child be asked to name the picture. A chart using similar pictures and similar testing can be calibrated for use at a 40cm test distance. This technique does not require the child to recognize letters or understand orientations (such as the tumbling E test) but does require verbal responses on the part of the child. Getting verbal responses may be limited by the child's attentiveness, visual fixations and willingness and/or ability to respond. An objective measurement of visual acuity can be made using the optokinetic nystagmus reflex.⁹ The child's attention is directed to a rotating drum with alternating black and white stripes on the drum. The widths of the stripes is calibrated to Snellen acuity by converting the visual subtense of each stripe to an acuity demand. A jerk nystagmus develops when the visual system is able to recognize that stripes exist on the rotating drum. During the slow phase of the nystagmus the eyes move in direction of rotation while attempting to follow the stripes. During the fast stage of the nystagmus the eyes jump back in the opposite direction to the drum rotation. The visual acuity is recorded as the last stripe size the child could follow. The observer is the person who decides when the eyes were last able to follow the stripes, hence this is an objective test for visual acuity. Another objective method to measure acuity is made using the visual evoked response. The children seated 6 meters from a screen which is about 2.5 by 2.5 meters in size. One electrode is placed on each ear lobe, these electrodes combine

with a third electrode placed on the inion, -a small protusion at the base of the skull, -to moniter the response of the visual cortex to visual stimuli. The child is presented a checkerboard pattern of light and dark areas on the screen. The response of the visual cortex is recorded as the visual evoked response and the amplitude of the response indicates whether the checkerboard target is seen or not. The size of the checkerboard is calibrated by visual subtense to Snellen acuity. The technique does not require that the child make any response and the child need only look at any part of the screen for a signal to be recorded. The testing sequence begins with large checkerboard patterns and proceeds to smaller checkerboards. Acuity is recorded as the last checkerboard pattern to give a noticeable visual evoked response.⁴ At this point the child's habitual lenses are modified to find the lenses that allow the smallest checkerboard recognition. Thus acuity and lens power maybe measured by this technique.⁷ A problem that may be encountered is that the child refuses to look at any part of the screen. This problem can be overcome by talking to the child or using other auditory distractions near the screen, which direct the child's visual fixations toward the screen.

A measure of lens power may also be obtained by using a retinascope. This exam begins with the child wearing the accustomed lenses. A lens bar or loose lenses are preferable to a phoropter or trial frame because nothing unaccustomed need be put on the child's head.⁶ The retinoscope lens can be correlated with the lens from the visual evoked response to determine the actual lens prescribed.

The eye posture (tropia or phoria) can be determined by having the child look at a squeaky toy or some other fixation target and then alternately occluding either eye (both unilateral and alternate phases can be done). The usual method is for the examiner to

place his fingers on the child's scalp and then drop the thumb down over one eye or the other. This "thumb occluder" is best, because the child is not as easily distracted as he would be with a standard paddle type occluder. The child's attention can best be directed to a fixation object by including noise with the novelty of the toy. In all cases the quality and magnitude of the deviation can be estimated rather than neutralized with a prism bar.

The first eye movement problem to look for is nystagmus. The determination is made in the primary direction of gaze. Any amount of pendular nystagmus may be caused by a decrement of central vision in both eyes.⁹ Pendular nystagmus usually indicates a loss of central acuity that took place before 2 years of age. If the nystagmus is of a jerk type it may indicate a neuromuscular problem of the eye or may indicate an infection of the ear.⁹

Pursuit and rotation eye movements can be checked with a small novelty fixation item at a distance of 40cm from the child. The quality of the response can be judged by how accurately the eyes are able to follow a target and whether the head or eyes are primarily involved in following the target. If there is any one area where the child prefers head to eye tracking this indicates a possible muscle paresis or field defect and reduced visual performance might take place in this direction of gaze.

Saccades can be tested with two squeaky toys and involves visually presenting only one at a time. The visually presented toy may be squeaked and then removed and a second toy introduced some distance away from the first toy. The noise is used as an aid to fixation and the quality of response depends upon the accuracy of fixation and the use of the eye versus head is judged.

Balance can be tested by having the examiner stand on one foot and asking the child to do the same. A laterality judgement

can be made at the same time by having the observer change feet and observing if the child tries to change feet also. Laterality can also be checked by having the child mimic the optometrist in touching the right or left hand to a right or left body part (knee, elbow, ear lobe). Should laterality skills be absent, then other kinds of activities such as written or printed language skills would be made more difficult.⁵ Eye hand coordination can be tested by holding a small reward item (ie raisin, toy) in the child's view and letting the child try to grasp the item. Several such presentations should indicate a hand preference and allow an appraisal of eye hand coordination. Lack of hand dominance and lack of eye hand coordination can indicate the level to which the child has developed. Hand preference should be established by age 2 for normal youngsters.¹¹ Next the child can be given a piece of paper and a pencil and asked to draw a picture. The hand preference can be established and the picture can be evaluated for closure of the figures, complexity of the drawing and relationship of figure to ground.³

Stereopsis and binocularity at 40cm can be tested using a Titmus stereo fly. This requires the child to wear polaroid lenses over any habitual prescription and may require good verbal communication between the examiner and the child. The child is asked to look at a picture of a fly which will be seen in depth if the child possesses stereo acuity. If the child grasps for the wings of the fly 5 or 6 cm from the page the child can be assumed to be using stereopsis and testing can proceed by asking him which animal in each row stands out or is closer to him. If the child doesn't quickly respond the examiner can rephrase the question and let the child try again. The longer the child looks at the stereo fly the more likely the child is to appreciate the depth, as the

stereo acuity is more noticable with a longer viewing time.

The child's motility can be appraised by observing the child's actions when he is not being lead by a supervisor. If the child walks around with an arm near a wall it may be a balance problem or he may have a defect in his visual field. Other signs of visual field defects would be bumping into obvious items in his path or feeling his way around a room or a head turn (to put his usable visual field more in front of him). This can be investigated by having the child look at an item straight ahead and then waving a finger or introducing a toy in the area of presumed defect. If the child doesn't acknowledge the hand or toy, even when the fixation item is removed, the field defect is confirmed. Ophthalmoscopy can also be done to look for a defect in the retina that corresponds to the field defect. The child's mobility can also be checked in a room under darkend conditions and performance be compared with lighted conditions. A slightly reduced ability to get around under darkend conditions suggests normal visual performance. If performance is severely reduced under dark conditions a rod defect is suspected. If performance is better under dim light, than normal room light, a posterior subcapsular cataract could be a causitive factor.¹⁰

Pupil reflexes should be checked for symmetry of pupil size and equal contraction or dilation upon change of illumination. Equal brightness and clearness of the fundus reflex should also be checked. Direct and consensual responses can be checked with a penlight at 20cm. Accomodative pupil reflex should be checked while moving in toward the nose during near point of convergence testing. Care should be taken during this test to shine the penlight on the forehead so the accomodative pupil response can be isolated from the pupillary response to light. The near point

of convergence can be judged for both break and recovery. Intact pupil reflexes establish intact neurological pathways for these reflexes. The near point of convergence test along with the cover test, pursuits, rotations and saccades allows an evaluation of the muscle control and muscle balance of the eyes.

Eyelids, lacrimal apparatus and conjunctiva should be checked for inflammations, infections or tumors. Lid twitching, if present, may indicate an uncorrected refractive error or allergic irritation or an irritation to the seventh nerve.¹

Slitlamp and ophthalmoscopy can be done to look for defects in the cornea, aqueous, lens, vitreous, or retina. Defects in the retina and optic nerve should be looked at very closely as these may be prodromal signs of more significant systemic disease. Direct ophthalmoscopy will allow an excellent appraisal of the macular area because the child will almost be certain to fixate on the ophthalmoscope light. Indirect ophthalmoscopy will allow an appraisal of the optic disk as well as the surrounding retina. Lawson suggests a preference for indirect ophthalmoscopy as this procedure does not require the examiner to touch the child.⁶

After any optometric exam the clinician does an analyses or rational of the case and makes an recommendations for therapy and treatment. The language disabled child, no matter what label other specialists have placed on him, deserves no less. A case in point was delineated by Streff while on staff at the Gessell Childrens Institute.¹³ At age 4 years 8 month "SG" was able to use only single words or "jargon" to try to communicate, didn't recognize or acknowledge the presence of strangers and cried and screamed upon a change of rooms. He had paper and pencil scores similar to those of an 18 month old child, was 15° esotropic and had a Slosson IQ score between 1 year to 1½ years. The

physicians report indicated "SG" possessed autistic like tendencies. Dr. Streff put yolked 15° base up prisms on bilaterally and noticed the child immediately became more visually attentive. The child was asked to wear the 15° base up bilaterally 5 minutes at a time and take the prisms off. Later the child could put on a pair of glasses with yolked 15° base down prisms on for 5 minutes. Two weeks later SG's vocabulary increased, he began to explore his world, his attention span increased and he was more responsive to people. Distance retinoscopy was now done and plus 1.00 diopter lenses were prescribed to partially neutralize the refractive error. While vision care over this short period of time didn't completely eliminate all the autistic characteristics it did allow SG longer periods of visual attention, better visual contact, and allowed establishing of rudimentary relationships with people.

Another case where optometric therapy has aided a child who was severely handicapped linguistically was reported by Frankel.² At age 53 months a psychological examiner diagnosed "W" as being autistic and probably retarded with no vision or hearing problems. At age 61 months an orthomolecular psychiatrist diagnosed "W" as being a childhood psychotic with autistic tendencies but without mental retardation. Vitamin therapy was begun and helped his psychological problems but the physician stated he would never read or write without learning better eye control. Frankel saw W at 62 months and observed poor pursuit movements and head tracking was preferred to eye tracking. Retinoscope findings were indeterminate and asymmetric body movements and asymmetric crawling patterns were noticed. Frankel agreed that W's vision system manifested traits usually found in schizophrenia: poor control of near space (wouldn't allow objects to come within arms length); monocular eye fixation patterns in which fixations are alternately one eye or the other but rarely

binocular; poor pursuit eye movements. Frankel found W's gross motor skills to be poor also. For training W was asked to walk on a rail without using other items to lean against for balance. Also W was given one pair of plus .25 lenses and another pair of minus .25 lenses to be worn alternately for periods of 20 minutes at a time. These lenses were to be worn at times other than while W was on the walking rail. The next visit plus .5 and minus .5 lenses were alternately worn and it was noted motor skills, speech, and behavior improved. The mother reported W was a "new child". W was now happy, responsive and began investigating his world. W now showed no autistic tendencies.

These two case studies suggest the kind of results that might be possible with a total vision care program including developemental (gross motor) training, vision training (including eye movement training) and lens therapy for the child that other professionals diagnosed as having a severe linguistic handicap. While these two case studies show significant results from optometric care of the severely language handicapped child, there still remains the question of what percentage of similarly afflicted children could derive similar benefits from vision care. There are no good studies in the current literature that concern vision therapy on a group of children with handicaps similar to those of SG and W. In any event, each child is an individual and it should not be assumed that since the child has a severe linguistic impairment that improvement in the child's performance is impossible through whatever kind of therapy is decided upon.

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